1. The isomerization of cyclopropane to form propene

CH3 — CH CH2CH2

is a first-order reaction. At 760 K, 15 percent of a sample of cyclopropane changes to propene in 6.8 minutes. What is the half-life of cyclopropane at 760 K?

2. Consider the two gaseous equilibria (*K*1 and *K*2):

SO2(*g*) + ½O2(*g*) SO3(*g*)       *K*1

2SO3(*g*) 2SO2(*g*) + O2(*g*)       *K*2

The values of the equilibrium constants *K*1 and *K*2 are related by \_\_\_\_\_\_\_\_.

3. The following reactions occur at 500 K. Arrange them in order of increasing tendency to proceed to completion (i.e., least completion greatest completion).

1. 2NOCl 2NO + Cl2        *KP* = 1.7 x 10–2
2. N2O4 2NO2                 *KP* = 1.5 x 103
3. 2SO3 2SO2 + O2         *KP* = 1.3 x 10–5
4. 2NO2 2NO + O2          *KP* = 5.9 x 10–5

4. On analysis, an equilibrium mixture for the reaction

2H2S(*g*) 2H2(*g*) + S2(*g*)

was found to contain 1.0 mol H2S, 4.0 mol H2, and 0.80 mol S2 in a 4.0 L vessel. Calculate the equilibrium constant for this reaction.

5. At 35oC, the equilibrium constant for the following reaction is *K*c = 1.6 x 10–5.

2NOCl(*g*) 2NO(*g*) + Cl2(*g*)

An equilibrium mixture was found to have the following concentrations of Cl2 and NOCl:

[Cl2] = 1.2 x 10–2 *M*; [NOCl] = 2.8 x 10–1 *M*. Calculate the concentration of NO(*g*) at equilibrium.

6. For the following reactions the equilibrium constants are defined.

A + 2B C       *K*1
C D + E         *K*2

Then for the reaction

A + 2B D + E       *K*c

the equilibrium constant must be equal to \_\_\_\_\_\_\_\_.

7. At 700 K, the reaction

2SO2(*g*) + O2(*g*) 2SO3(*g*)

has an equilibrium constant *K*c = 4.3 x 106, and the following concentrations are present:

[SO2] = 0.10 *M*
[SO3] = 10 *M*
[O2] = 0.10 *M*

Is the mixture at equilibrium? If not at equilibrium, in which direction—**left to right** or **right to left**— will the reaction occur to reach equilibrium?

8. For the following reaction at equilibrium, which choice gives a change that will shift the position of equilibrium to favor formation of more products?

2NOBr(*g*) 2NO(*g*) + Br2(*g*)       *H*orxn = 30 kJ